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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/083,541	02/27/2002	Isao Nakajima	837.1982	5570

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EXAMINER	
LE, TRAN Q	

ART UNIT	PAPER NUMBER
2633	

DATE MAILED: 02/07/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/083,541	NAKAJIMA ET AL.	
	Examiner	Art Unit	
	Tran Q. Le	2633	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 February 2002*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4-11 and 13-18* is/are rejected.

7)☒ Claim(s) *3,12,19 and 20* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _____ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *Jan 8,2003*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claim 2 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Regarding claim 2, it is not clear what the "block code length in the forward error correction" is since it is not defined in the specification (p. 13, line 1). Therefore, the definition of the natural frequency is not clearly understood in order to enable the step of setting the scrambling frequency higher than the natural frequency in the forward error correction.

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 5 and 14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claims 5 and 14, it is not clear what it means by "said phase modulator has different modulation efficiencies to a first polarization plane and a second

polarization plane orthogonal to the first polarization plane". What is a first polarization plane?? What is a second polarization plane??

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1, 2, 4, 8-11, 13, 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saunders et al. (US Pub. No. 2002/0039217 A1), in view of Fang et al. (US Patent No. 6,437,892 B1).

Regarding claims 1 and 8-10, Saunders discloses a method comprising the steps of: generating a plurality of optical signals (36-1, 36-n, fig. 3) to which forward error correction is applied (37-1...37-n, fig. 3); polarization scrambling each of the optical signals (PM, fig. 3); and wavelength division multiplexing the optical signals to obtain WDM signal light (34, fig. 3). Saunders differs from the claimed invention in that he fails to teach a scrambling frequency in the polarization scrambling step is set higher than a natural frequency in the forward error correction. However, Fang, in the same field of endeavor, teaches the scrambling frequency in the polarization scrambling step is set higher than a natural frequency in the forward error correction (col. 7, lines 25-37). As it is taught by Fang, it would have been obvious that a polarization scrambler such as the one of Saunders can be set with a scrambling frequency higher than a natural

frequency in the forward error correction in order to enable the bit errors to be corrected with a FEC process.

Regarding claims 2 and 11, as it is understood in view of 112 problem, Fang further teaches the natural frequency is the reciprocal of the period of block code lengths in the forward error correction (col. 7,lines 25-37).

Regarding claims 8 and 17, Saunders further teaches the step of transmitting the WDM signal light by an optical fiber transmission line (fig. 3).

Regarding claims 9 and 18, Saunders further teaches the step of: separating the WDM signal light transmitted into a plurality of optical signals (44, fig. 3); and decoding each of the optical signals obtained by the separating step (43-1, 43-n, fig. 3), according to the forward error correction (fig. 3).

Regarding claims 4 and 13, Saunders further teaches the step of providing a phase modulator for phase modulating each optical signal (38-1, 38-n, fig. 3).

7. Claims 5 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saunders et al. (US Pub. No. 2002/0039217 A1), in view of Fang et al. (US Patent No. 6,437,892 B1), and in further view of Suzuki et al. (6,459,518 B1).

Regarding claims 5 and 14, as it is understood in view of 112 problem, the combination of Saunders and Fang discloses all the aspects as applied to claim 1 above, except fails to teach a phase modulator for phase modulating each optical signal has different modulation efficiencies to a first polarization plane and a second polarization plane orthogonal to the first polarization plane; each optical signal is linearly

polarized light having a polarization plane; and the polarization scrambling step further comprises the step of 45.degree. inclining the polarization plane of each optical signal with respect to the first and second polarization planes.

However, Suzuki, in the same field of endeavor, teaches a phase modulator for phase modulating each optical signal (44, fig. 4) has different modulation efficiencies to a first polarization plane and a second polarization plane orthogonal to the first polarization plane (fig. 4 and col. 1, lines 41-46, each phase modulator provides maximum modulation efficiency on each incident light, therefore, it is obvious that it will have different modulation efficiencies to a first and second polarization planes); and the polarization scrambling step further comprises the step of 45.degree. inclining the polarization plane of each optical signal with respect to the first and second polarization planes (col. 2, lines 23-27).

Therefore, it would have been obvious for one ordinary skill in the art at the time the invention was made to incorporate a phase modulator such as the one of Suzuki for the phase modulation in the modified optical data transmission system of Saunders and Fang in order to scramble the polarization of each signal light by modulating a phase of each signal light for improving their transmission characteristics and for suppressing polarization dependence of the transmission system before being combined into a multiplexed signal light and transmitting to the transmission line.

As to the optical signal being linearly polarized, Fang teaches the transmission of linearly polarized light signal (col. 5, lines 38-50).

8. Claims 6, 7, 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saunders et al. (US Pub. No. 2002/0039217 A1), in view of Fang et al. (US Patent No. 6,437,892 B1), and in further view of Ono (US Patent No. 5,295,013).

Regarding claims 6 and 15, the combination of Saunders and Fang discloses all the aspects as applied to claim 1 above, except fails to teach the step of frequency modulating each optical signal and transmitting the frequency-modulated optical signal through a birefringent optical medium.

However, Ono, in the same field of endeavor, teaches the step of frequency modulating each optical signal (1, fig. 1) and transmitting the frequency-modulated optical signal through a birefringent optical medium (22, fig. 1).

Therefore, it would have been obvious for one ordinary skill in the art at the time the invention was made to incorporate the frequency modulator such as the one of Ono for frequency modulating each optical signal to the modified optical data transmission system of Saunders and Fang in order to eliminate the need for an external modulator and thus avoid the losses associated with such a modulator.

Regarding claims 7 and 16, the combination of Saunders and Fang discloses all the aspects as applied to claim 1 above, except fails to teach the frequency modulating step comprises the step of modulating a bias current for a laser diode for outputting each optical signal as linearly polarized light having a polarization plane; the birefringent optical medium comprises a polarization maintaining fiber having a fast axis and a slow axis orthogonal to the fast axis; and the polarization scrambling step further comprises

the step of 45.degree. inclining the polarization plane of each optical signal with respect to the fast axis and the slow axis.

However, Ono, in the same field of endeavor, teaches the step of modulating a bias current for a laser diode for outputting each optical signal as linearly polarized light having a polarization plane (fig. 1, col. 2, lines 60-68, and col. 3, lines 1-13); the birefringent optical medium comprises a polarization maintaining fiber having a fast axis and a slow axis orthogonal to the fast axis (22, fig. 1, col. 3, lines 32-35); and the polarization scrambling step further comprises the step of 45.degree. inclining the polarization plane of each optical signal with respect to the fast axis and the slow axis (fig. 3 and col. 3, lines 43-45).

Therefore, it would have been obvious for one ordinary skill in the art at the time the invention was made to incorporate the frequency modulation method such as the one of Ono to the modified optical data transmission system of Saunders and Fang in order to provide a direct modulation for a light signal without acquiring any active devices, therefore, reduce cost based on simplified configuration.

Allowable Subject Matter

9. Claims 3, 12, 19 and 20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

10. The following is a statement of reasons for the indication of allowable subject matter:

Regarding claims 3 and 12, the prior art of Saunders and Fang fails to teach the difference in the scrambling frequency between two optical signals having adjacent wavelengths of the plurality of optical signals is higher than the natural frequency.

Regarding claims 19 and 20, the prior art of Saunders and Fang fails to teach the scrambling frequencies of any pairs of wavelength channels with some channels interposed therein are the same, as long as there is enough space between the wavelengths sufficient for suppressing nonlinear effects and crosstalks.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Wedding (US Pub. No. 2002/0060822) is cited to show a method of improving the signal quality of optical signal and also a transmission system for transmitting optical signals with FEC using polarization modulator.

Smith (US Pat. No. 5,023,948) is cited to show frequency modulating a semiconductor laser by directly control of injection current and transmitting the frequency modulated signal into a birefringent medium.

Bergano (US Pub. No. 2004/0161245) is cited to show polarization scrambling method using phase modulation, amplitude modulation, and polarization modulation.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tran Q. Le whose telephone number is (571)272-2046. The examiner can normally be reached on 8am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on (571)272-3022. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

M. R. Sedighian

M. R. SEDIGHIAN
PRIMARY EXAMINER

TQL